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FLEET RELIABILITY ASSESSMENT PROGRAM, VOLUME 2C, EQUIPMENT REPO-ETC(U)
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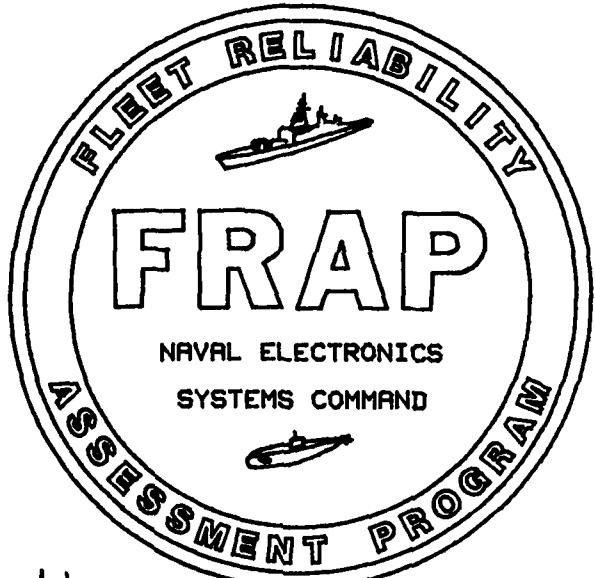
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VOLUME 2C

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EQUIPMENT REPORT

CV-3333/U VOCODER

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CRANE, INDIANA

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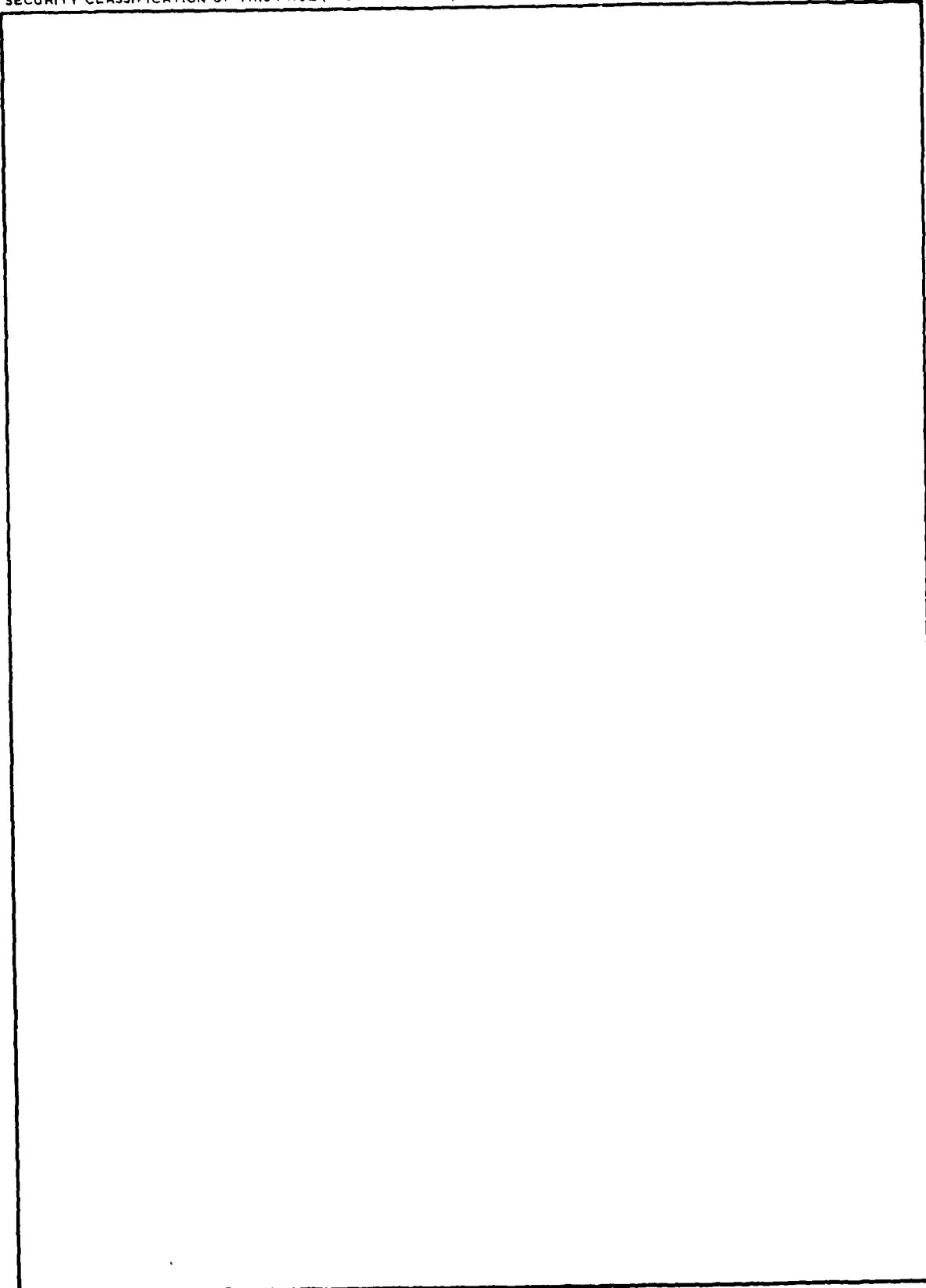
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The report contains an assessment of CV-2723/4 Volume 1 reliability performance obtained on 22 platforms. From approximately June 1975 thru March of 1977 2 failures occurred during 77,200 hours of operating hours. The first failure was a 44 hour failure.		

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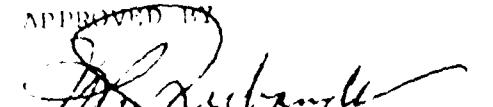
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VOLUME 2C CV-3333/U

EQUIPMENT REPORT

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VOLUME 2C CV-3333 EQUIPMENT REPORT

SECTION I - RESULTS

1-1 RESULTS SUMMARY

Between July 1978 and June 1979, FRAP conducted a field study on the CV-3333 Audio-Digital Converter (VOCODER). A total of 47,677 operating hours were accumulated on 22 systems which had been equipped with Elapsed Time Meters by FRAP team members. A total of 2 failures (one equipment failure) were reported for an observed equipment MTBF of 47,677 hours. See Table 1-1 for a summary of RMA results.

1-1.1 PROBLEMS

No problems were identified with the CV-3333 itself, but an interface problem was discovered concerning remote push-to-talk (PTT) handsets. This involved the PTT signaling and resulted in a modification to the A6 module to include a strap option for the TA-840 handset.

SECTION II - SYSTEM DESCRIPTION

2-1 GENERAL

The CV-3333/U Audio-Digital Converter (VOCODER) is a solid state, all digital voice analyzer-data converter which provides digitized speech output at 2400 baud (bits/second). Voice input is processed and converted into a serial Non-Return to Zero (NRZ) bit stream which can then be encrypted and/or combined with other data streams for transmission. At the distant end, the bit stream is converted back into intelligible audio and delivered to a telephone style handset.

The unit incorporates a self-test mode which exercises major components of the equipment and gives an illuminated GO/NO-GO indication. A loopback mode allows the complete send/receive channel, including radios, interfaces, crypto and the like, to be fully exercised as a confidence test.

2-2 MISSION DESCRIPTION

The CV-3333/U as installed in the Fleet are an integral part of the Shipboard Fleet Satellite Communications Narrow Band Secure Voice System. In this application, the CV-3333/U is used with the ON-143(V) Interconnecting group and the KG-36-4 cryptographic machine to produce the enciphered bit stream which is then transmitted by the AN/WS-3 Satellite Communications Set. If the installation is solely for secure voice, the ON-143(V)4 is used with the CV-3333. Figure 2-1 shows this configuration. If NAVMACS A+ or SSIKS share the AN/WS-3 with the CV-3333, the ON-143(V)4 and ON-143(V)5 are used respectively.

The Narrow Band Secure Voice system provides long range ship to ship and ship to shore communications to Fleet users on a shared channel basis. Access and coordination are controlled by the responsible Naval Communications Station in the area of the satellite's footprint.

LEGEND

1. OPER = OPERATIONAL *
2. EQUIP = EQUIPMENT *
3. PARTS = PARTS REPLACEMENT *

TABLE 1-1. DATA SUMMARY FOR CV-3333

PARAMETER	OPER	EQUIP	PARTS
OPERATIONAL			
Calendar Hours	111,624	111,624	111,624
Operating Hours	47,677	47,677	47,677
Duty Cycle	0.427	0.427	0.427
Sample Size	22	22	22
RELIABILITY			
Number of Failures	2	1	1
Time Between Failures-Mean	23,838	47,677	47,677
Time Between Failures-Median	16,524	33,040	33,040
Distribution	---	---	---
MAINTAINABILITY			
Total Repair Time	33	13	13
Number of Repairs	2	1	1
Time to Repair-Mean	16.5	13	13
Time to Repair-Median	---	---	---
Distribution	---	---	---
Total Down Time	240	168	168
Repairs (or Maint. Act.)	---	---	---
Down Time-Mean	120	168	168
Down Time-Median	---	---	---
Distribution	---	---	---
AVAILABILITY			
Inherent	0.9993	0.9997	0.9997
Observed-Mean	---	---	---
Observed-Median	---	---	---
Effective	0.9949	0.9965	0.9965

* Reference Volume 1, Paragraph 3-4
NOTE: All Time Units Are In Hours

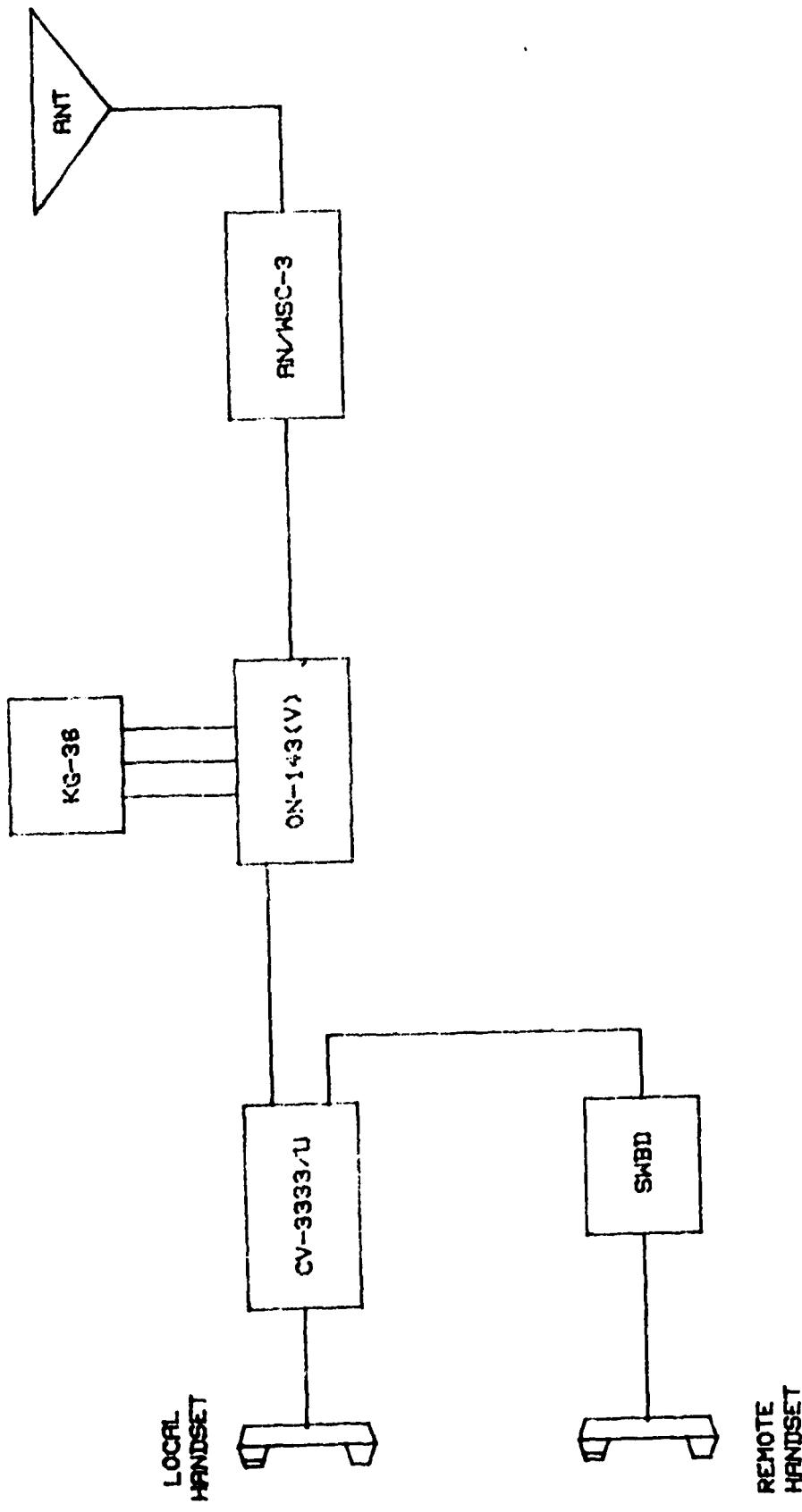


FIGURE 2-1. NARROW BAND SECURE VOICE SYSTEM

2-3 EQUIPMENT DESCRIPTION

The CV-3333 is a single self-contained box needing only power and hook-up to the communications channels to function. In most installations, an external clock is used to synchronize system timing. Internally, the CV-3333 is divided into send (analyzer) and receive (synthesizer) sections which share a common power supply. These two sections are further subdivided into replaceable modules. Figure 2-2 shows a simplified functional diagram for the unit.

Incoming speech first passes through the analog to digital converter in module A5 where it is filtered, normalized (adjusted to a standard power level), and digitized. The information in the resulting bit stream is analyzed by modules A7 thru A13, which function under the timing and control of module A6 to compress the bandwidth of the input speech. The bit stream then exits the unit through module A6, which contains the voltage level conversion and interface circuitry. During self-test, module A7 originates the test pattern used to exercise the transmit portions of the unit.

Incoming 2400 baud data from the distant end enters the unit through module A4, the incoming interface and level converter. Under the timing and control of module A4, modules A1 thru A3 perform the inverse of the analysis/bandwidth compression process. In this process, speech is synthesized (built up) from harmonics which have been generated in accordance with the pitch information coded into the bit stream. These harmonics are weighted, summed and combined with a controlled noise source (to allow generation of sounds like the letter "H"). The composite analog signal passes through the A5 module where it is filtered and amplified to the proper power level.

The reconstructed audio can be heard on the handset at the unit's front panel or via a remote handset. The resulting speech is quite understandable and the originator's vocal characteristics are carried through sufficiently so as to be readily identifiable. During self-test, the A4 module produces the test pattern for the receive circuitry.

SECTION III - SPECIFICATIONS

3-1 RELIABILITY

The specified MTBF for the CV-3333/U is 2000 hours (Θ_{MTBF} as defined by MIL-STD-781) as called out in the production contract.

3-2 MAINTAINABILITY

The specified equipment repair time (ERT) is (not to exceed) 20 minutes. Fault isolation is to be accomplished using the self-test functions and (in the case of the power supply) simple test instruments. Module repair is to be done at depot level. No intermediate level maintenance is required. Under Allowance Parts List (APL) number 62715620, CV-3333/U users are allowed one A4 module and one A13 module, plus various piece parts.

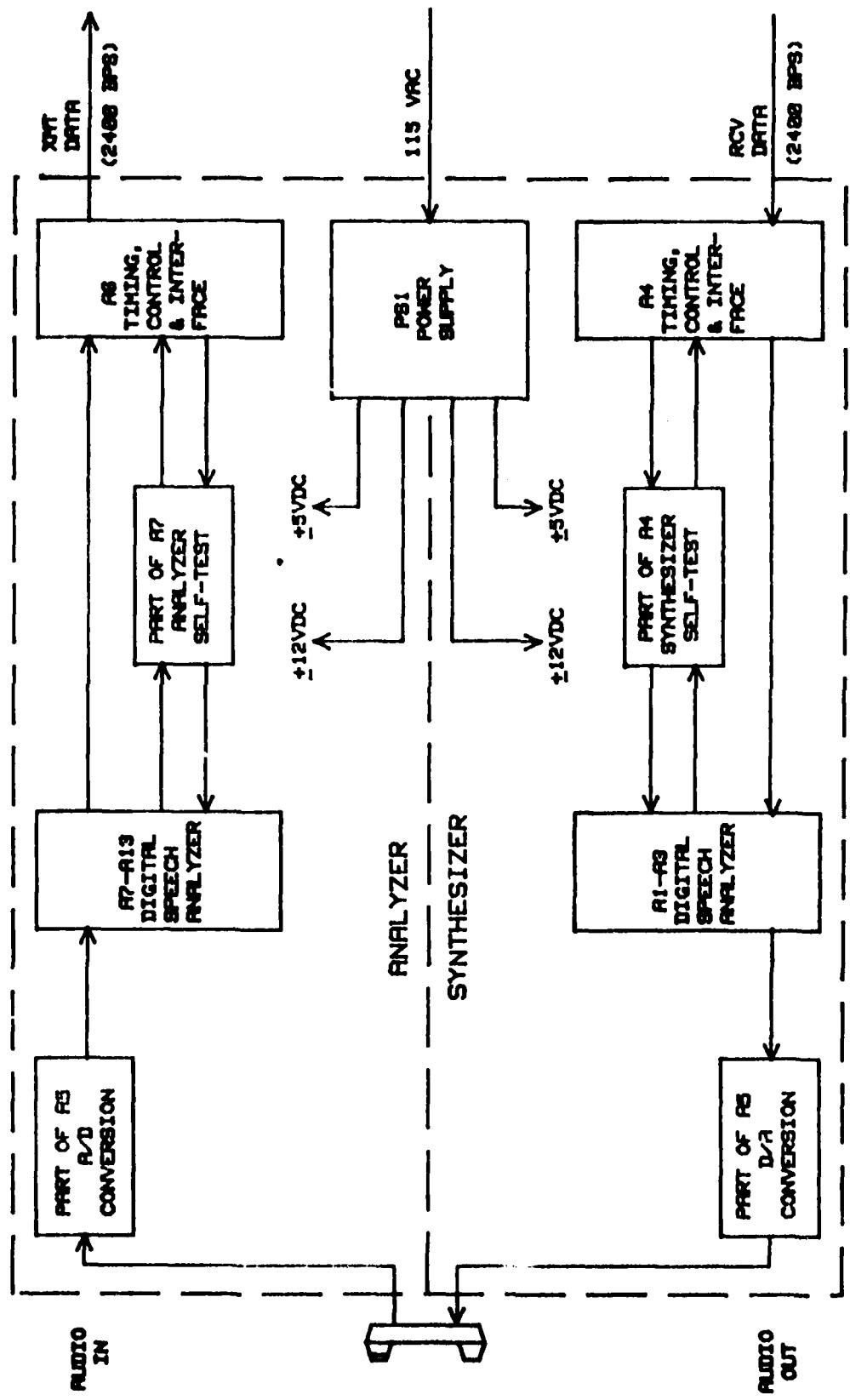


FIGURE 2-2. CV-3333/U SIMPLIFIED FUNCTIONAL DIAGRAM

3-3 AVAILABILITY

No formal Availability specifications are provided.

SECTION IV - PROBLEMS

The CV-3333/U does not contain an Elapsed Time Meter (ETM). The only other equipment in the Secure Voice system that has an ETM is the AN/WSC-3 Satellite Communications Set. However, this ETM does not accurately reflect the operating time of the CV-3333/U unit in that the AN/WSC-3 is often used to support other missions, i.e., NAVMACS A+ and SSIXS. This required FRAP to obtain and install outboard ETMs on participating platforms.

No equipment related problems were identified during the study period. An installation problem was discovered with Push-To-Talk (PTT) remote (red area) handsets, which affects only remote operation of the CV-3333/U. It was found that the TA-840 handset and the TA-790 handset differ in the manner in which the PTT signalling is accomplished. The TA-840 signals a "TALK" condition (which should activate the CV-3333 to transmit) by grounding the PTT keyline. The TA-790 signals a "TALK" condition by interconnecting the PTT keyline and the PTT keyline return.

SECTION V - CORRECTIVE ACTIONS

FRAP obtained ETM units which were installed on CV-3333/U units on participating platforms. These were wired to the power switch during the FRAP initial briefing and were removed during debriefing. The tolerance of Fleet users for this extra piece of hardware during the study period is appreciated. It is recommended that consideration be given to include an ETM on future procurements of the CV-3333.

The keyline signalling problem on remote handsets has been solved by a modification to the A6 module. With this modification, interface with the type of remote handset to be used is selected as a strap option.

SECTION VI - EQUIP ITEM RELIABILITY MODEL

System reliability is defined as the probability of performing a specified function or mission under specified conditions for a specified time. Reliability models are word statements or block diagrams which represent the requirements for mission success. The FRAP equipment models are used to determine the achieved operational reliability and to assess the effect of RCPs and other corrective action upon system reliability. Maintenance Action Reports are compared against the model to determine if a reported failure results in a system failure, or if not a failure, then the degree of system degradation. In addition, the model is used in determining logistic support requirements.

Maintenance of Naval shipboard equipment is accomplished by replacement or repair of components at Organizational (O), Intermediate (I), or Depot (D) repair levels. Ships Maintenance and Material Management (3-M) normally collects organizational level repair data but not intermediate or depot level repair data. Using 3-M field data requires that the lowest components of the model be the lowest level reported by 3-M,

i.e., the 0-level replaceable component. This 0-level component can be a piece-part, printed circuit board, major assembly, or whatever is planned for the 0-level maintenance concept.

Figure 6-1 is the reliability model block diagram for the CV-3333. The CV-3333 system is WRA 31.

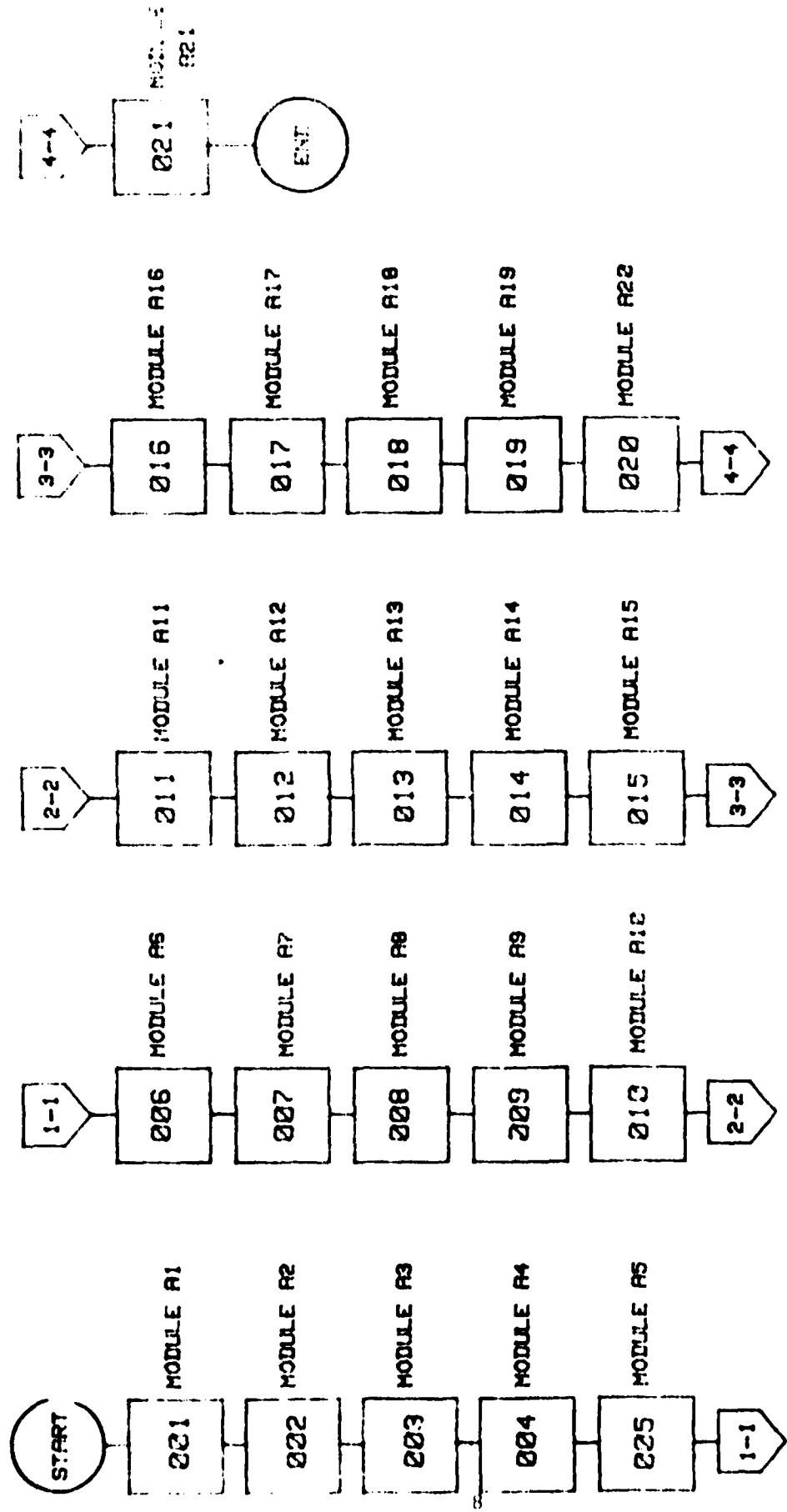


FIGURE 6-1
EQUIPMENT/O-LEVEL RELIABILITY BLOCK DIAGRAM FOR CV-3333/U TURA 3:1

SECTION VII - ANALYSES

7-1 RELIABILITY

Only operational reliability analysis was performed since insufficient number of failures were encountered to justify maintainability and availability analysis.

SYSTEM	DESCRIPTION	DATE	FLIGHT RELIABILITY ASSESSMENT DATA					
			RTM	FAILURE TYPE	OPERATE	FAILURE TIME	DUTY	OL3
CV3731	ALTAIR	4-215	0.	INITIAL	0.	0.000	0	0
CV3731	ALTAIR	4-241	620.	CENSORED	620.	620.	.994	0
CV3731	ALTAIR	4-714	1340.	CENSORED	1340.	1340.	.986	0
CV3731	ALTAIR	3-334	2965.	CENSORED	2965.	2965.	1.004	0
CV3731	ALTAIR	9-03	3673.	CENSORED	3673.	3673.	1.000	0
CV3731	ALTAIR	9-078	5443.	CENSORED	5443.	5443.	.995	0
INITIAL RELIABILITY ASSESSMENT								
CV3331	AYLWIN	4-335	0.	INITIAL	0.	0.000	0	0
CV3331	AYLWIN	4-335	1.	FAILURE	1.	1.	0.000	31
CV3331	AYLWIN	4-365	72.	CENSORED	72.	71.	.100	0
CV3331	AYLWIN	9-031	195.	CENSORED	195.	186.	.126	0
CV3331	AYLWIN	9-059	276.	CENSORED	276.	275.	.129	0
CV3331	AYLWIN	9-090	399.	CENSORED	399.	398.	.139	0
CV3331	AYLWIN	9-120	648.	CENSORED	648.	647.	.180	0
CV3331	ELUF STAGE	4-145	0.	INITIAL	0.	0.000	0	0
CV3331	ELUF STAGE	9-047	4722.	CENSORED	4722.	4722.	.737	0
CV3331	CONSTELLATION	8-164	0.	INITIAL	0.	0.000	0	0
CV3331	CONSTELLATION	8-275	567.	CENSORED	567.	567.	.213	0
CV3331	CONSTELLATION	4-164	2699.	CENSORED	2699.	2699.	.562	0
CV3331	CONSTELLATION	9-032	3630.	CENSORED	3630.	3630.	.649	0
CV3331	CONSTELLATION	9-090	4962.	CENSORED	4962.	4962.	.770	0
CV3331	CONSTELLATION	9-120	5582.	CENSORED	5582.	5582.	.725	0
CV3331	CORONADO	4-223	0.	INITIAL	0.	0.000	0	0
CV3331	CORONADO	4-279	113.	CENSORED	113.	113.	.084	0
CV3331	CORONADO	5-307	113.	CENSORED	113.	113.	.056	0
CV3331	CORONADO	9-005	113.	CENSORED	113.	113.	.032	0
CV3331	CORONADO	9-032	113.	CENSORED	113.	113.	.027	0
CV3331	CORONADO	9-064	113.	CENSORED	113.	113.	.023	0
CV3331	CORONADO	9-094	113.	CENSORED	113.	113.	.020	0
CV3331	CORONADO	9-127	113.	CENSORED	113.	113.	.018	0
CV3331	CORONADO	9-155	113.	CENSORED	113.	113.	.016	0
CV3331	DALE	4-217	0.	INITIAL	0.	0.000	0	0
CV3331	DEWEY	4-298	0.	INITIAL	0.	0.000	0	0
CV3331	DEWEY	4-360	334.	CENSORED	334.	334.	.224	0
CV3331	DEWEY	4-360	1145.	CENSORED	1145.	1145.	.492	0
CV3331	DEWEY	4-360	1751.	CENSORED	1751.	1751.	.584	0
CV3331	DEWEY	9-027	2046.	CENSORED	2046.	2046.	.559	0
CV3331	EISENHOWER	4-205	0.	INITIAL	0.	0.000	0	0
CV3331	EISENHOWER	4-222	337.	CENSORED	337.	337.	.426	0
CV3331	EISENHOWER	9-047	4770.	CENSORED	4770.	4770.	.960	0
CV3331	FLASHER	4-132	3.	INITIAL	0.	0.000	0	0
CV3331	FLASHER	4-162	115.	CENSORED	112.	112.	.156	0
CV3331	FLASHER	4-25	135.	CENSORED	132.	132.	.095	0
CV3331	FLASHER	9-060	136.	CENSORED	133.	133.	.060	0
CV3331	FLASHER	9-090	141.	CENSORED	138.	138.	.047	0
CV3331	FLASHER	9-124	160.	FINAL	157.	157.	.042	0
CV3331	GUAM	4-216	0.	INITIAL	0.	0.000	0	0
CV3331	GUAM	4-334	1047.	FAILURE	1047.	1047.	.752	0

SYSTEM	NAME	TYPE	FLIGHT RELIABILITY ASSESSMENT DATA			DUTY	WRA
			CTE	FAILURE TYPE	OPEN RATE		
CV3333	JAWF	MULTIPLX	4145	0.	INITIAL	0.	0.000
CV3333	JAWF	MULTIPLX	9053	46.	CENSORED	94.	0.013
CV3333	JUAGER	MULTIPLX	9091	65.	FINAL	95.	0.012
CV3333	KINMIR	MULTIPLX	6268	5.	INITIAL	0.	0.000
CV3333	KINMIR	MULTIPLX	3445	5.	FINAL	34.80.	0.729
CV3333	LEAMY	MULTIPLX	9132	42.	INITIAL	0.	0.000
CV3333	LEAMY	MULTIPLX	9061	16.5.	FINAL	1542.	0.590
CV3333	LEAMY	MULTIPLX	9061	16.5.	INITIAL	0.	0.000
CV3333	LEAMY	MULTIPLX	9061	16.5.	FINAL	3542.	0.
CV3333	NE#	MULTIPLX	8299	0.	CENSORED	0.	0.000
CV3333	NE#	MULTIPLX	8324	312.	CENSORED	312.	0.520
CV3333	NE#	MULTIPLX	8359	1177.	CENSORED	1177.	0.417
CV3333	NE#	MULTIPLX	9020	1794.	CENSORED	1794.	0.469
CV3333	NE#	MULTIPLX	9054	1840.	CENSORED	1840.	0.439
CV3333	NE#	MULTIPLX	9055	1863.	CENSORED	1863.	0.482
CV3333	NE#	MULTIPLX	9130	2233.	FINAL	2233.	0.475
CV3333	NE#	MULTIPLX	9132	0.	INITIAL	0.	0.000
CV3333	NE#	MULTIPLX	9056	598.	FINAL	598.	0.252
CV3333	PINTACO	MULTIPLX	8212	4.	INITIAL	0.	0.000
CV3333	PINTACO	MULTIPLX	9092	23.	FINAL	19.	0.003
CV3333	PUGY	MULTIPLX	8244	0.	INITIAL	0.	0.000
CV3333	PUGY	MULTIPLX	9305	151.	CENSORED	151.	0.103
CV3333	PUGY	MULTIPLX	9126	1532.	FINAL	1532.	0.256
CV3333	PUGY	MULTIPLX	9242	0.	INITIAL	0.	0.000
CV3333	PUGY	MULTIPLX	8272	2.	CENSORED	2.	0.003
CV3333	PUGY	MULTIPLX	9334	2.	CENSORED	2.	0.001
CV3333	PUGY	MULTIPLX	9363	2.	CENSORED	2.	0.001
CV3333	PUGY	MULTIPLX	9024	3.	CENSORED	3.	0.001
CV3333	PUGY	MULTIPLX	9164	0.	INITIAL	0.	0.000
CV3333	PUGY	MULTIPLX	8256	2020.	CENSORED	2020.	0.915
CV3333	PANGW	MULTIPLX	9257	2557.	CENSORED	2557.	0.943
CV3333	PANGW	MULTIPLX	9134	3879.	CENSORED	3879.	0.951
CV3333	PANGW	MULTIPLX	8353	4527.	CENSORED	4527.	0.948
CV3333	PANGW	MULTIPLX	9045	5580.	CENSORED	5580.	0.945
CV3333	SAWATOGA	MULTIPLX	8201	0.	INITIAL	0.	0.000
CV3333	SAWATOGA	MULTIPLX	6213	144.	CENSORED	144.	0.500
CV3333	SAWATOGA	MULTIPLX	8235	1691.	CENSORED	1691.	0.523
CV3333	SAWATOGA	MULTIPLX	9102	2471.	CENSORED	2471.	0.620
CV3333	SAWATOGA	MULTIPLX	9032	1007.	CENSORED	3007.	0.639
CV3333	SEADOGON	MULTIPLX	8233	0.	INITIAL	0.	0.000
CV3333	SEADOGON	MULTIPLX	9265	7.	CENSORED	7.	0.000
CV3333	SEADOGON	MULTIPLX	9244	11.	CENSORED	11.	0.008
CV3333	SEADOGON	MULTIPLX	9134	26.	CENSORED	26.	0.011
CV3333	SEADOGON	MULTIPLX	9161	29.	CENSORED	29.	0.010
CV3333	SEADOGON	MULTIPLX	9090	13.	CENSORED	33.	0.006
CV3333	SEADOGON	MULTIPLX	9167	36.	FINAL	34.	0.006
CV3333	SEADOGON	MULTIPLX	9220	0.	INITIAL	0.	0.000
CV3333	SEADOGON	MULTIPLX	9225	94.	CENSORED	94.	0.116
CV3333	SEADOGON	MULTIPLX	9245	125.	CENSORED	125.	0.084
CV3333	SEADOGON	MULTIPLX	9235	289.	CENSORED	289.	0.105
CV3333	SEADOGON	MULTIPLX	9165	173.	CENSORED	373.	0.117

SYSTEM	SPLIT NUMBER	RELIABILITY ASSESSMENT DATA						
		FAILURE TYPE	OPERATE	FAILURE TIME	DUTY	WRA	OL 1	OL 2
VREF1_A11	CV3331	INITIAL	0.	0.000	0	0	0	0
VREF1_A11	CV3331	CENSORED	99.	89.	0.120	0	0	0
VREF1_A11	CV3331	CENSORED	252.	252.	0.096	0	0	0
VREF1_A11	CV3331	CENSORED	374.	374.	0.121	0	0	0
VREF1_A11	CV3331	CENSORED	962.	962.	0.241	0	0	0
VREF1_A11	CV3331	CENSORED	1551.	1551.	0.131	0	0	0
VREF1_A11	CV3331	FINAL	2643.	2643.	0.162	0	0	0

ESTATE PLANNING

CV ELENA SISTEMAS

EQUIPMENT OPERATING HOURS (H.H.) = 47677.0 CALENDAR HOURS (C.H.) = 111624.0 DUTY CYCLE (D.H./C.H.) = .427

THESE STATEMENTS ARE BASED UPON THE INFORMATION ASUMED

FIG. 9. THE ASSUMED DISTRIBUTION.

PERCENT UCL 94.500. MEDIAN = 23739.500. FRT. MEDIAN = 16523.500. 90 PER CENT LCL FOR MEAN = 9580. 90 PER CENT UCL FOR MEAN = 90650.186
THE EQUIPMENT MEETS THE SPECIFICATIONS

W F L I A M I L I Y

-43333 O-LEVEL SUMMARY

#	-LEVEL	-LEVEL	-LEVEL	O-LEVEL SUMMARY				OBSERVED TIMES			RELIABILITY PROBLEM
				FAILURES	LOWER CONF LIM	UPPER CONF LIM	MFAN	UPPFRA 90	SPEC MTBF	FAILURE TIMES	
1.	12957.18	47677.00	437515.19	52632.00	1.00	1.00	1.00	NO			

1. 12957.18 47677.00 437515.19 52632.00

WHAT MIGHT I DO
IN THE PROBLEM AREAS
OF SENSORY FOR CV3333
PROBLEMS
WITHIN THE
SCHOOL SYSTEM

